EXHIBIT A

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	RM No. _____
Amendment of Parts 2.106, 25.143,	)	
and 25.202 of the Commission's Rules	)	
to Require Operation of LEO MSS	)	
Systems Using TDMA/FDMA Techniques	)	
in the 1615.5-1626.5 MHz	)	
Frequency Bands	)	

To: The Commission

PETITION FOR RULEMAKING

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July 26, 2002

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SUMMARY

Iridium requests that the Commission expeditiously amend Sections 2.106, 25.143, and 25.202 of its rules to require entities operating Big LEO systems in the 1615.5-1626.5 MHz frequency band to employ TDMA/FDMA techniques rather than CDMA techniques.

Adopting these changes would be consistent with the Commission's original plans for the Big LEO spectrum. When the Commission first contemplated the authorization of Big LEO systems in the 1.6/2.4 GHz band, it proposed that certain frequencies authorized for use by CDMA operators would be reallocated to TDMA/FDMA operators in the event that none or only one of the CDMA systems actually deployed. Ultimately, the Commission declined to adopt a specific reallocation scheme, due to a variety of concerns. Seven years later, only one CDMA system has entered service and the concerns that previously led the Commission to decline to adopt an "automatic" redistribution of the 1.6 GHz band have been rendered moot by the passage of time. Thus, the redistribution of a significant portion of the Big LEO spectrum from CDMA operators to TDMA/FDMA operators is in order.

Expedited grant of this Petition would permit Iridium to meet the current and increasing demand for existing and new communications services in both the United States and abroad, including voice and data services to rural areas and secure, real-time communications services to the U.S. military in remote areas of conflict.

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To: The Commission

PETITION FOR RULEMAKING

Iridium Constellation LLC ("Iridium") hereby submits a petition for rulemaking ("Petition"), pursuant to Section 1.401 of the Commission's Rules,[1] requesting an amendment to Sections 2.106, 25.143, and 25.202 of the Rules to require low-earth orbit ("LEO") Mobile Satellite Systems ("MSS") operating in the 1615.5-1626.5 MHz frequency band to employ time division/frequency division multiple access ("TDMA/FDMA") techniques rather than code division multiple access ("CDMA") techniques.[2] Iridium also requests that the Commission initiate proceedings to grant the relief requested herein on an expedited basis.

This redistribution of spectrum between TDMA/FDMA and CDMA-based MSS systems operating in the 1.6 MHz portion of the "Big LEO" band will enable Iridium to meet the growing demand for its services, particularly the provision of voice and data services to rural

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[1] 47 C.F.R. §1.401.

[2] The Commission's rules do not currently specify whether a Big LEO MSS system must use CDMA or TDMA/FDMA techniques. However, in Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, *Report and Order*, 9 FCC Rcd. 5936 (1994) ("Big LEO Order"), the Commissioned specified the frequency bands available to CDMA and TDMA/FDMA systems, indicated that each system's operating authority would be subject to these specifications, and contemplated that a future rulemaking would be necessary to effect any changes. *Id.* at 5954-5960.

areas (both in the United States and abroad) and mission-critical services to the U.S. military. Moreover, this redistribution can be accomplished without material harm to any other Big LEO system.

Indeed, as will be discussed more fully below, the Commission previously contemplated a redistribution of spectrum among TDMA/FDMA and CDMA-based Big LEO systems, should several conditions be met. At this point in time, each of those conditions either has been met, or will be met in the near future, and, therefore, the Commission should grant the instant Petition.

I. BACKGROUND

In 1994, the Commission had before it five applicants seeking to provide MSS service in the 1610-1626.5 MHz and 2483.5-2500 MHz frequency bands: TRW, Inc. ("TRW"), Constellation Communications, Inc. ("Constellation"), Mobile Communications Holdings, Inc. ("MCHI"), Loral/Qualcomm Partnership, L.P. ("Globalstar"), and Iridium's predecessor, Motorola Satellite Communications, Inc. ("Motorola"). The Commission proposed to assign 11.35 MHz of shared bandwidth at 1610-1621.35 MHz to the four CDMA systems for their uplinks, reasoning that "11.5 MHz is sufficient to accommodate up to four operational CDMA systems."[3] For downlink purposes, the four CDMA sysms were to be assigned another shared 16.5 MHz in the 2.4 MHz band. By comparison, Motorola's Iridium system was to be assigned only 5.15 MHz in the 1621.35-1626.5 MHz band, for both uplink and downlink purposes.[4]

It was further proposed in the NPRM that if only one CDMA system ultimately was deployed, the Commission would automatically reduce the 1.6 GHz bandwidth assigned to

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[3] *Id.*

[4] *See* Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, *Notice of Proposed Rulemaking*, 9 FCC Rcd. 1094, 1111 (1994) ("NPRM").

that system from 11.35 MHz to 8.25 MHz,[5] and then assign the 3.1 MHz of spectrum made available at 1618.25-1621.35 MHz to the FDMA/TDMA system "upon a showing of need."[6]

After receiving comments from interested parties, the Commission adopted its proposed spectrum-sharing plan with little modification.[7] However, the Commission declined to make a final determination regarding the proposed reassignment of the 3.1 MHz of spectrum between 1618.25 MHz and 1621.35 MHz, citing concerns regarding possible coordination with the radioastronomy service ("RAS"), the Russian Global Navigation Satellite System ("GLONASS"), and possible foreign-licensed MSS systems.[8] Instead, the Commission concluded that a decision regarding a redistribution of a portion of the 1.6 GHz band would be made, if necessary, "in the context of a rulemaking, based on the circumstances that have developed at that time."[9]

In 1995, the five Big LEO applications were granted.[10] Seven years later, only the Iridium and Globalstar systems have entered service. TRW and MCHI no longer hold Big

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5 *See id.* at 1112.

6 *See id.*

7 *See* Big LEO Order.

8 *See id.* at 5959-60.

9 *Id.* at 5960.

10 See Application of Motorola Satellite Communications, Inc. for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 MHz Band, *Order and Authorization*, 10 FCC Rcd. 2268 (1995); Application of Constellation Communications, Inc. for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 MHz Band, *Order and Authorization*, 12 FCC Rcd. 9651 (1995); Application of Mobile Communications Holdings, Inc. for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 MHz Band, *Order and Authorization*, 12 FCC Rcd. 9663 (1995); Application of Loral/Qualcomm Partnership, L.P. for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 MHz Band, *Order and Authorization*, 10 FCC Rcd. 2333 (1995); Application of TRW, Inc. for Authority to Construct, Launch, and Operate a Low Earth Orbit

LEO licenses.[11] Although the Commission has not yet announced the cancellation of the Constellation license, it appears that little, if any, progress has been made during the past seven years in the construction of that system, as Constellation has twice requested that its construction milestones be postponed.[12] Under these circumstances, it would appear that the "unlikely event" that only one CDMA system will be implemented has, for all practical purposes, become a reality.[13]

II. THE NEW TDMA/FDMA – CDMA SPECTRUM BALANCE

Because the Iridium system has been authorized to operate only within a 5.15 MHz band -- and must operate both its uplinks and downlinks in that narrow band -- it faces significant spectrum constraints. By contrast, Globalstar may utilize more than five times the amount of spectrum currently available to Iridium, and will continue to be, for the foreseeable future, the only MSS system operating in the 1610-1621.35 MHz (uplink) and 2483.5-2500 MHz (downlink) CDMA bands.[14]

In an effort to meet current critical customer needs and near-term future demand, it is essential that Iridium be permitted to expand its operations into the 1615.5-1621.35 MHz frequency band. As demonstrated below, this can be done without undue constraint on

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Satellite System in the 1616-1626.5 MHz Band, *Order and Authorization*, 10 FCC Rcd. 2263 (1995).

[11] *See Public Notice*, Report No. SPB-114, at 3 (rel. January 15, 1998); Mobile Communications Holdings, Inc., *Memorandum Opinion and Order*, 16 FCC Rcd. 11766 (2001), *reconsideration denied* Mobile Communications Holdings, Inc., *Memorandum Opinion and Order*, DA 02-1468, rel. June 24, 2002.

[12] *See* Public Notice, Report No. SAT-00055, 2000 FCC LEXIS 5283 (September 28, 2000); Public Notice, Report No. SAT-00085, 2001 FCC LEXIS 4977 (September 19, 2001); *see* Letter to Ms. Magalie Roman Salas from Robert A. Mazer, dated August 29, 2001, File Nos. 17-DSS-P-91 (48), CSS-91-013, 10-SAT-AMEND-95, 159-SAT-AMEND-96.

[13] NPRM at 1112.

[14] Big LEO Order at 5956.

Globalstar, which would retain access to a total of 22 MHz: 5.5 MHz in the 1.6 GHz band and 16.5 MHz in the 2.4 GHz band, or twice as much as the 11 MHz in the 1.6 GHz band that would be available to Iridium if the relief sought in the instant Petition ultimately is granted. If the 11.5 MHz initially allocated for CDMA system uplinks in the 1.6 GHz band was sufficient to accommodate four CDMA systems,[15] certainly 5.5 MHz is sufficient to accommodate the uplink requirements of a single CDMA system, particularly where its downlink band (2.4 GHz) is well separated from the uplink. A total of 22 MHz should be more than adequate to enable Globalstar to expand its existing satellite services, as well as provide any ancillary terrestrial services that may eventually be authorized by the Commission.[16]

Obviously, the instant request for a reallocation of 5.85 MHz exceeds the 3.1 MHz originally contemplated in the NPRM. However, as Iridium demonstrates below, events of the past seven years have overtaken the Commission's original rationale. First, the contingencies that dissuaded the Commission from adopting its original proposal to shift 3.1 MHz of spectrum to the TDMA/FDMA system -- (1) the possibility that GLONASS would not be timely reassigned; (2) the possibility of burdensome sharing issues with RAS; and (3) the potentially negative impact of then-unknown foreign-licensed MSS systems -- have not materialized.[17] GLONASS has not been incorporated into global navigation systems and requires no protection from Big LEO systems.[18] RAS sharing issues have not proven overly burdensome, and no

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[15] *Id.* at 1111.

[16] *See* Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band, *Notice of Proposed Rulemaking*, 16 FCC Rcd. 15532 (2001).

[17] *See* Big LEO Order at 5960.

[18] *See* Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, *Memorandum Opinion and Order*, 11 FCC Rcd. 12861, 12865 (1996).

foreign system of the sort hypothesized by the Commission in the Big LEO Order[19] has been deployed.

Second, the Commission's additional prior concern -- that, in the event that many of the Big LEO systems licensed in 1997 did not deploy, some spectrum be available for new MSS systems -- is no longer valid.[20] In 1997, subsequent to the Commission's action in the Big LEO Order, the Commission reallocated a portion of the 2 GHz band (1990-2025 MHz for uplink and 2165-2200 MHz for downlink) for new MSS systems,[21] and in July 2001 it awarded licenses for eight new MSS systems in that band.[22] Put simply, there is no reason to believe that spectrum in the Big LEO band still needs to be reserved for potential new MSS entrants. Rather,

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[19] *See* Big LEO Order at 5960.

[20] *See, e.g.*, NPRM at 1112.

[21] *See* Amendment of Section 2.106 of the Commission's rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, *First Report and Order and Third Notice of Proposed Rule Making*, 12 FCC Rcd. 7388, 7393-95 (1997), *on recon.*, *Memorandum Opinion and Order and Third Notice of Proposed Rule Making and Order*, 13 FCC Rcd. 23949 (1998).

[22] *See* Application of The Boeing Company Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System, *Order and Authorization*, 16 FCC Rcd. 13691; Application of Celsat America, Inc. Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System, *Order and Authorization*, 16 FCC Rcd. 13712; Application of Constellation Communications Holdings, Inc. Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System, *Order and Authorization*, 16 FCC Rcd. 13724; Application of Globalstar, L.P. for Authority to Launch and Operate a Mobile-Satellite Service System in the 2 GHz Band, *Order and Authorization*, 16 FCC Rcd. 13739; ICO Services Limited Letter of Intent to Provide Mobile-Satellite Service in the 2 GHz Bands, *Order and Authorization*, 16 FCC Rcd. 13762; Application of Iridium LLC Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System, *Order and Authorization*, 16 FCC Rcd. 13778; Application of Mobile Communications Holdings, Inc. Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System, *Order and Authorization*, 16 FCC Rcd. 13794; TMI Communications & Co., L.P. Letter of Intent to Provide Mobile-Satellite Service in the 2 GHz Bands, *Order and Authorization*, 16 FCC Rcd. 13808.

the 1.6 GHz portion of that band should be redistributed more equitably among the only two Big LEO systems that have entered service.

III. NEW DEMAND FOR IRIDIUM SERVICES

The Iridium system originally was conceived as providing "a global roaming complement to terrestrial wireless services."[23] The primary users of such a system were expected to be business travelers who desired the ability to make and receive calls on a worldwide basis from a single phone.[24] Obviously, by the time that the system entered operation, many of the marketplace assumptions that underpinned this strategy had been overtaken by events.

The new Iridium has significantly revamped its business model. Of course, Iridium still provides service to individual users needing communications services where landline or terrestrial wireless service is unavailable. Additionally, however, Iridium is meeting the growing demand for "instant infrastructure" in rural areas -- in both developed and developing nations -- and is providing critical communications services to the U.S. government, including for use by the U.S. military in remote areas of conflict. As discussed more fully below, near-term demand for these services requires that Iridium have access to additional spectrum.

A. A Grant of This Petition Would Allow Iridium to Meet Growing Demand for Service to Both Rural and Urban Areas Within the United States.

The Commission has stated unequivocally that it is "committed to policies promoting the provision of broadband communications services to rural, unserved and

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[23] Iridium, Inc. Form S-1 at 6, filed July 14, 1995.

[24] *See id.* at 13.

underserved areas of the country."[25] Even under its current spectrum constraints, Iridium is providing invaluable services in the most remote portions of the nation, while also offering innovative solutions in some of the most populous regions. Should the Commission grant this Petition, Iridium will be able to meet the rapidly increasing demand for the wide array of innovative services described below.

Currently, Iridium is providing a number of critical communications services to users in remote portions of Alaska, including to several commercial fishing operations, which use the Iridium service as their primary means of communication for vessels at sea. Additionally, Iridium services now allow general aviation aircraft and air-taxis in Alaska to communicate while in transit. Because most of these flights are conducted under visual flight rules, the pilots are without the guidance of any air traffic control system. As a result, Iridium provides the only means of critical operational communication.

With the spectrum requested in this Petition, Iridium could expand substantially the services it offers these residents of rural Alaska, including devising a solution to the inadequacies of the Alaskan air traffic control system. The FAA, under its Capstone program, is exploring alternatives to improve aviation safety by supplementing its VHF communications. The Iridium system is an ideal answer, given its ability to provide not only a means of communication, but also tracking and positioning information.

Even in urban areas, Iridium is providing a host of novel services. For example, under an agreement with the California State Power Authority and a number of large retail shopping centers, the Iridium system provides load curtailment services to reduce the demands on California's power grid. In brief, in times of peak power demand, this service automatically

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[25] *See, e.g.,* Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band, *Notice of Proposed Rulemaking*, 16 FCC Rcd. 15532, 15543 (2001). *See generally* 47 U.S.C. §706.

will shut down the cooling systems for the common areas of the shopping centers, reducing considerably the load on the power grid with no noticeable effect on the temperature in the shopping centers. In return, the participating shopping centers receive an exemption from rolling blackouts.

Grant of the instant Petition would enable Iridium to expand considerably the scope of this low cost service to include numerous industrial and other commercial facilities in the area. The additional spectrum also would allow Iridium to offer a wider variety of different monitoring and control services within the same service area, including, *inter alia*, remote monitoring and control of oil wells, oil and gas pipelines and the like.

Finally, as described in greater detail below, Iridium has developed a suite of new "instant infrastructure" services for rural areas, which can be deployed both in the United States and elsewhere.

B. A Grant of This Petition Would Allow Iridium to Expand Its "Instant Infrastructure" Services

As the Commission has noted, LEO systems can "provide those countries that have not been able to develop a nationwide communication service an 'instant' global telecommunications infrastructure at minimal cost."[26] This capability "offers the potential for revolutionary advances in all areas supported by communications. These areas include, but are not limited to, health care, education, emergency communications from small villages, public safety, routine governmental and civic exchanges, industrial communications and monitoring, and manufacturing."[27]

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[26] NPRM at 1095.

[27] *Id.* at 1105-06. The Commission has repeatedly recognized the benefits of providing services via MSS to rural or remote areas that are not readily or economically served by existing terrestrial services. *See, e.g.*, Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band, *Notice of Proposed Rulemaking*, 16 FCC Rcd. 15532 (2001) (*citing* Amendment of the Commission's

In addition to the traditional rural telephony concept, in which individual users purchase a handset and enter into a service contract, Iridium has developed and begun to deploy Teleboutiques, which provide a full array of telecommunications services for areas in which the local population generally does not have the resources to afford individual service. The Teleboutique is based on an Iridium handset providing both voice and data capability. Individual users access these services with a prepaid calling card.

Iridium is currently providing these and similar services throughout Central and Western Africa, Latin America, and the Middle East, and is experiencing a substantial growth in demand. These services are fast becoming a vital component of the economic fabric of these regions.

For example, in Senegal, Iridium has been licensed to provide community phone services to 1,000 villages in the initial phase of a nationwide "instant infrastructure" program. In Australia, Iridium has become a major communications provider, offering services otherwise unavailable to residents of the Outback.

Unfortunately, Iridium's ability to meet growing demand for expansion of these and related services is increasingly constrained, because many of these rural areas are within the same satellite footprint. Iridium already faces high levels of capacity utilization for some spot beams during peak demand hours. As Iridium continues to expand into new markets within a given satellite's footprint, these capacity constraints will become increasingly burdensome.

Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, *Memorandum Opinion and Order*, 9 FCC Rcd. 4957, 4995-96 (1994); Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band, IB Docket No. 99-81, *Notice of Proposed Rulemaking*, 14 FCC Rcd. 4843, 4846 (1999); Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service, ET Docket No. 95-18, *First Report and Order and Further Notice of Proposed Rulemaking*, 12 FCC Rcd. 7388, 7389 (1997)).

For example, it is projected that, over the course of the next nine months, the Senegal services noted above will, standing alone, absorb over 50% of the system's capacity in that region. This demand will severely limit the expansion of these services, not only in Senegal, but in neighboring countries such as Guinea and Sierra Leone, which also currently are being served by Iridium. The anticipated localized demand within various spot beams also will limit the effective reuse of frequencies to serve neighboring regions, which have similar growing demand for service. A grant of this Petition would allow Iridium to continue its efforts to expand further the availability of an affordable, nationwide, telecommunications infrastructure to rural areas throughout the world.

C. A Grant of This Petition Would Allow Iridium to Expand Its Provision Critical Services to the U.S. Military in Regions of Conflict

The U.S. military requires a wide array of secure, instantaneous communications services in remote regions of conflict. Navy Rear Admiral Robert Nutwell, the Deputy Assistant Secretary of Defense for command, control, communications, intelligence, surveillance, reconnaissance and space, recently noted that "[o]ur dependence on spectrum is growing because our operation is becoming increasingly mobile."[28] Rear Admiral Ken Slaght, U.S. Navy, vice commander, SPAWAR, has also noted the military's dire communications needs, recalling that "[i]n Desert Storm, orders and communications between the Air Force and Navy ships had to be printed out and then flown in on a helicopter to waiting commanders due to a lack of available space segment on proprietary military satellite communications systems."[29] The events of September 11, and the subsequent focus on smaller conflicts in remote areas, have further demonstrated the military's need for expanded communications capabilities.

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[28] Dawn S. Olney, *Defense in Tug-of-War Over Wireless Spectrum*, Newsbytes News Network, June 18, 2001, at 10.

[29] *DoD and Satellites: The Commercial Ties That Bind*, Satellite Today, March 29, 2001, at 15.

As the Commission is aware, even with its existing spectrum constraints, Iridium is providing essential, low-cost, portable, and secure communications communications services to various U.S. government users, including the U.S. military. As Colonel Barry Patterson, chief of the Satellite Communications Division, United States Space Command, U.S. Air Force, put it: "We have some forces that can't get along today without [the] Iridium system."[30]

While Iridium has been able to provide these crucial communications services to the military in support of numerous ongoing operations, its ability to meet the ever increasing demand for secure, mobile communications in several contiguous regions may be significantly constrained by a lack of spectrum. With the additional spectrum sought herein, Iridium could provide the increased capacity and enhanced capabilities required by the U.S. military. Moreover, as discussed above, access to the additional spectrum requested herein would ensure that increased demand within one region would not threaten the efficiency or availability of services to neighboring regions.

IV. CONCLUSION

As demonstrated above, events of the past seven years have undermined the rationale for the Commission's original division of the Big LEO band among TDMA/FDMA and CDMA systems. It is time to revisit that decision, and to do so on an expedited basis. Granting Iridium access to the 1615.5-1621.35 MHz band will enable it to meet present and demonstrable future increases in customer demand and to expand its service offerings into new markets,

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[30] *Id.*

without any material adverse impact on Globalstar's current or future prospects. Thus, Iridium requests that the Commission act swiftly to grant the relief requested herein.

Respectfully submitted,

IRIDIUM SATELITE LLC

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January 13, 2003

The Honorable Michael K. Powell
Chairman
Federal Communications Commission
445 12th Street, S.W.
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Re: Iridium Spectrum Report; *Ex Parte* Presentation in IB 01-185.

Dear Chairman Powell:

Pursuant to your office's request, Iridium is herewith submitting information concerning its current and future spectrum capacity challenges. The data provided in the attached spectrum engineering report provides compelling evidence of the pressing need for the Federal Communications Commission ("FCC" or "Commission") to address the outdated Big LEO band plan generally and to allocate immediately an additional six MHz of spectrum to meet Iridium's growing customer needs. In addition, the spectrum engineering report documents that Iridium could not provide ancillary terrestrial services (ATC) within its limited 5.15 MHz of unpaired spectrum, but that ATC services could be quickly added to Iridium's customer offerings if the spectrum available for its Big LEO service is increased as proposed.

Specifically, the Iridium Spectrum Report and prior *ex parte* filings in this docket provide the following facts for the Commission's consideration:

Iridium Has a Pressing Need for Additional MSS Spectrum. Iridium is an MSS success story that needs additional spectrum to continue that success. Iridium's system use globally has been growing at very rapid rate with some regions experiencing growth as high as 2500% per annum. Department of Defense ("DOD") subscriber growth has been 650% over the past 24 months. In supporting DOD needs, services to regions such as the Middle East have spiked at times to near system capacity levels. These important demands will continue as, just last month, DOD extended its contract with Iridium to call for unlimited airtime use for 20,000 of its personnel. Similarly, Western U.S. and Alaska regional service has increased 380% with peak uses in summer months rising to near capacity levels. With anticipated successes in expanding services to existing and other global, regional and rural customers, the trend in growth should continue assuming adequate spectrum is available to support high quality services.

The Critical Nature of Iridium's Service Requires Levels of Reliability and Performance Greater than Other Services. In contrast to other services, Iridium's customers must have the highest possible levels of service reliability and performance. The typical Iridium customer needs phone service in areas or conditions under which traditional telecommunications services are not available or dependable. Real world examples are the U.S. military operating in critical conditions, workers or visitors in remote parts of Alaska, and everything from rural communities in the U.S. to tribal villages in Africa. A common theme is that none of these customers can afford to have congestion, blocked calls or service interruptions in using their Iridium services.

Iridium Has Established High Network Standards to Ensure that Its Customers Needs Are Being Met. In effect, Iridium must design and operate its system to handle peak uses that are often regional in nature. Its satellite system must be able to accommodate intense uses for limited periods of time on a frequently regionally concentrated basis. This imposes challenges that become increasingly acute as Iridium's customer base and customer minutes of use grow over time.

Iridium's Big LEO System Is Facing Spectrum Shortage Challenges for Its Critical Needs Users. The attached Spectrum Report documents that the Iridium system is already experiencing a significant number of days per year where usage is over 80% of capacity. This is significant because at the 80% plus mark, the system begins to experience service interruptions and blocked calls. Indeed, the Spectrum Report shows that Iridium projects that the 80% capacity level will be exceeded for over 300 days in 2003 in a variety of regions, absent additional spectrum. The number of regions experiencing 80% capacity utilization on a given day will also increase.

The Spectrum Band Plans Previously Submitted to the Commission Would Address Iridium's Big LEO Spectrum Challenges. In its prior filings in this docket, Iridium proposed two alternative band plans to remedy current spectrum imbalances in the Big LEO service and to ensure a sound and competitive framework for Big LEO service providers in the future. The proposals call for assignment of an additional 6 MHz of spectrum to Iridium for two reasons: (1) 6 MHz is needed to accommodate current and anticipated Big LEO service needs; and, (2) the Iridium system was originally designed for at least a 10.5 MHz spectrum allocation, which means that Iridium rapidly and efficiently could utilize expanded available spectrum.

Additional Spectrum Is Required for Iridium to Provide ATC Services. The attached Spectrum Report also confirms that Iridium cannot provide ATC within its existing 5.15 MHz spectrum allocation. There is no technically sound way to offer commercial terrestrial and satellite services with the limited spectrum available while maintaining required system availability. Simply stated, Iridium – one of only two Big LEO providers – would not be able to take advantage of such spectrum flexibility. With additional spectrum, Iridium can promptly move forward to offer ATC. The Iridium system is readily adaptable to exploit such flexible spectrum use opportunities with an appropriate and equitable spectrum allocation.

The Big LEO Band Plan and ATC Issues Could Be Addressed On an Interim Basis Pending an Expedited Rulemaking. The Big LEO service, as noted above, consists of just Iridium and GlobalStar. The FCC could ensure that both companies have sufficient spectrum to provide both MSS and ATC by reassigning additional spectrum to Iridium on an interim basis pending conclusion of an expedited rulemaking with the goal of ensuring comparable spectrum allocations available for both of the competing providers. Iridium would be willing to accept additional spectrum on an interim basis conditioned upon the outcome of that expedited rulemaking.

An FCC Decision to Allow One Big LEO Provider (GlobalStar) to Offer ATC Immediately While Leaving the Only Other Big LEO Provider (Iridium) Unable to Offer ATC Would Irrevocably Doom Competition. There are only two Big LEO service providers. A competitive industry structure obviously cannot persist if the FCC gives one competitor the immediate ability to provide ATC while the other competitor is asked to wait at the starting blocks for an unspecified amount of time with no certainty as to the outcome. Capital markets and customers will recognize the obvious inequity. Simply stated, sound spectrum management requires the Commission to address outdated spectrum band plans before – not after – ATC rights are implemented.

Pursuant to Section 1.1206 of the FCC's rules, an original and one copy of this written presentation is being filed with the Commission's Secretary for inclusion in IB Docket No. 01-185. Please do not hesitate to contact me with any questions.

Respectfully submitted,

Richard E. Wiley
Counsel to Iridium Satellite LLC

cc (by hand delivery): Marlene H. Dortch, Secretary
cc (by email): Commissioner Kathleen Abernathy
Commissioner Kevin Martin
Commissioner Michael Copps
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IRIDIUM SATELLITE LLC SPECTRUM REPORT

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1.0 Iridium and Its Spectrum Needs

Iridium Satellite LLC (Iridium) operates a global, mobile satellite system offering paging, voice and data communications. Since acquiring the assets of bankrupt Iridium LLC in December 2000 and launching commercial service in March 2001, Iridium has developed a successful business strategy that targets customers in rural and remote areas in the United States and globally. These general public and government customers have significant needs that cannot be met by any other communications systems and require an extremely high level of service reliability. As a result, demand for the Iridium satellite system is growing rapidly with system growth on a global basis of over 350% and regional usage growth as high as 25 fold experienced from 2001 to 2002. In the Western U.S./Alaska region, usage increased by 380% from May 2001 – May 2002. In addition, U.S. Government usage of Iridium services has seen dramatic increases with 10 fold growth during the past two years. Iridium anticipates this growth to accelerate as concentrated regional/rural programs continue to be introduced much along the same growth trends as it has experienced in other areas of the world.

2.0 Purpose of Iridium Spectrum Report

This Spectrum Report responds to the FCC's request for information on Iridium's spectrum requirements. It supplements Iridium's July 2002 petition for additional spectrum to be used for its mobile satellite service (MSS). This report describes Iridium's customers and their communications requirements and then reviews system capabilities and system usage. Against this background, the report provides an analysis of Iridium's spectrum requirements for MSS and confirms Iridium's ability to utilize rapidly additional spectrum to meet its MSS customers' needs. It concludes with an analysis of spectrum use for ATC and an unequivocal demonstration that the Iridium TDMA network can be readily modified to support ATC with the provision of additional spectrum.

3.0 Iridium Customers and Customer Requirements

The U.S. Department of Defense (DOD) subscribes to the Iridium system for essential global mobile secure handheld communications services. Iridium network use by the DOD has experienced greater than 650% subscriber growth over the past 24 months with the subscriber level rapidly approaching the 20,000 base subscriber level in its recently extended contract. Its monthly minute usage has grown by a factor of ten (over 1000%) in the past 24 months. Key features of the Iridium handset (small, lightweight and secure) have made it ideal for DOD emergency operations when speed, mobility and secure connectivity are required. The regions of interest to the DOD often need to be supported with little warning or preparation. During the last twelve months, several regional operations occurred within areas that also had extensive commercial usage. The combined usage levels on the Iridium system exceeded 70% of the system capacity during several of these events. While these operations were fortunately not degraded, it is important to note that these levels occurred within the first two years of

DOD/commercial Iridium service and are likely to increase. While much of the DOD traffic is supported by the DOD gateway, there are several critical operations supported using Iridium cut-through communications services. These handset-to-handset services impact the in-theater capacity as well as the Iridium capacity in the United States since many of these receiving handsets are located in command centers in the United States.

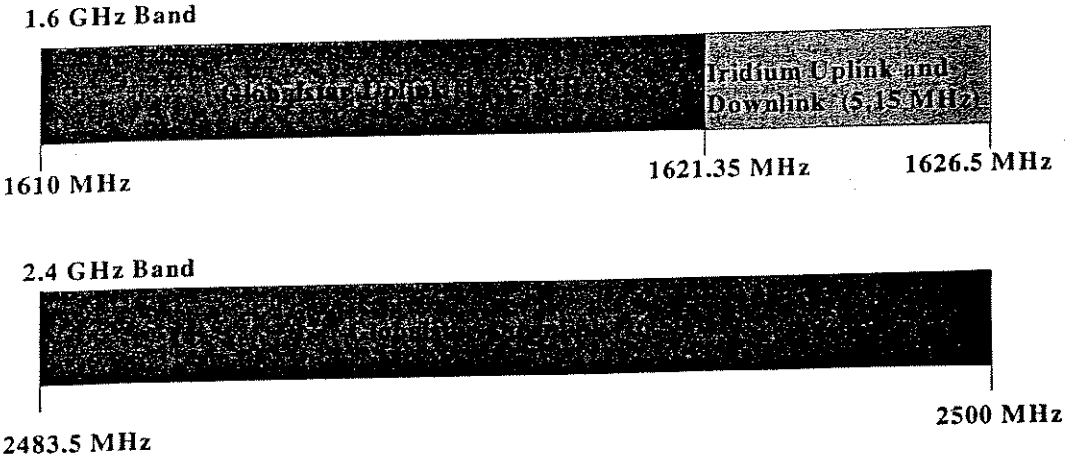
In addition, Iridium is a critical thread in the communications tapestry throughout Alaska, which has many remote areas and sparse terrestrial connectivity. In Alaska, private aircraft, remote industrial applications, fisherman, and the general rural populace are increasingly relying upon Iridium for vital communications services. The service is also ideally suited for U.S. industrial applications such as heavy construction, defense/military, emergency services, maritime, mining, forestry, oil and gas and aviation.

Iridium is also emerging as a viable service to connect rural African communities with their neighbors and the world. In nations such as Angola, Nigeria, Guinea, and Sierra Leone, Iridium is experiencing a substantial growth in demand. Additionally, Iridium has recently commenced service in remote areas of Senegal, Australia and Israel, with planned expansion into Malaysia, Papua New Guinea, and Equatorial Guinea. Critical rural services include health care, education, emergency communications from small villages, public safety, routine governmental and civic exchanges, industrial communications and monitoring, and manufacturing. These rural services place serious demands on system capacity.

4.0 System Capabilities

As depicted below, the FCC has allocated 33 MHz of spectrum in the 1.6 GHz and 2.4 GHz bands to MSS. The Iridium satellite system currently operates in 5.15 MHz of unpaired spectrum in the 1.6 GHz band. Iridium uses 4.8 MHz of spectrum for voice, data and paging traffic. The remaining 0.35 MHz spectrum assigned to Iridium is not usable for communications traffic because it is needed to protect against system self-interference and for overhead requirements (enabling seamless handoffs between satellites, satellite beams, timing and synchronization of the Iridium network).

BIG LEO BANDS
Allocations and Assignments



The CDMA uplink and downlink spectrum was to be shared among Globalstar, Constellation, Odyssey and Ellipso, however, only Globalstar remains.

5.0 System Usage

The system usage characteristics of the Iridium network vary greatly from a typical mobile environment. For example, users of the Iridium network are clustered in particular regions frequently where no other telecommunications services are available. Iridium's traffic is also seasonal or event driven, leading to peaks that occur in small geographic areas. As a result, the system capacity must accommodate peak loading in these specialized regions without a reduction in service reliability. This is driven by user requirements' not system design and is particularly critical given that the missions of many of the current Iridium users' (including emergency workers, military users, search and rescue personnel, etc) are life critical and demand highly reliable mobile communications.

Iridium has also experienced increased use of its handset-to-handset service and has been required to allot a growing amount of spectrum capacity to this service. Handset-to-handset service is made possible due to Iridium's processing-satellite technology and unique "cut-through" service, which allow Iridium to provide regional services independent of any existing local infrastructure (including local PSTN services or regional gateways). Each handset-to-handset call requires twice as much spectrum as a call connected via a regional gateway. This is because two satellite channels are required to complete the call—one for the handset-to-satellite uplink and another for the satellite-to-handset downlink. In addition, the volume of handset-to-handset calls has been increasing. In particular, Iridium

customers in rural and isolated environments where access to other telecommunications infrastructure may not be available have been making extensive use of this feature.

The Iridium network has also been experiencing greater data usage. Iridium began making available data services in addition to voice communications in June 2001. Since that time, data service has been growing in popularity at a much more rapid rate than demand for voice services. In fact, data communications growth over the past two years has been consistently higher than voice growth and currently account for 30 percent of traffic on the satellite system. Data communications services strain system capacity much more than typical voice communications due to their packet-based nature. Analysis of Iridium's network also reveals that subscribers who use data on average use 5 times more call minutes than do typical voice subscribers. The data use is typically clustered around particular times of day within a region.

6.0 Analysis of Spectrum Requirements for MSS

Iridium monitors both system performance and usage to ensure high quality service. System performance is characterized using call establishment and call drop rates. Call establishment rate refers to the number of successful calls established over the total number of mobile call attempts. The call drop rate refers to the unintended disconnection of mobile calls during a pre-determined call-holding period. The nominal call establishment rate for Iridium is greater than 98% with a call drop rate of less than 2% for a call hold time of three minutes. This nominal performance is measured and monitored with unobstructed views of the satellite constellation. Global traffic data on all users indicate that nominal "real world" environment factors result in a typical call drop rate of 5% - 7%. The system call drop rate becomes pronounced when the satellite traffic exceeds 80% system capacity utilization with resulting call drop rates of 25% or greater. This call drop rate can be reduced with additional spectrum that eliminates system inefficiencies.

Iridium's call establishment rate is similarly negatively affected when satellite traffic loading exceeds 80%. While the system is not able to track these failed call attempts since they are never recorded within the Iridium system, this condition is substantiated from affected users. Exacerbating these conditions, at 80% system capacity utilization, it can be expected that the system will quickly reach maximum loading at which point no additional calls would be established.

Iridium's past and predicted future system usage shows a need for additional spectrum to ensure continued high quality service. To evaluate system usage, Iridium compiled actual call traffic data (by day) over the past two years for all regions globally. This data was evaluated to select an appropriate call distribution representative for the constellation. The resulting call distribution was then analyzed for the resulting level of capacity compared with the total regional capacity provided by the system. Finally, Iridium compared several

representative regions with system loading data recorded by the global satellite system to verify statistical accuracy and validate the traffic profile assumptions.

The global and regional tables below summarize the episodic usage experienced to date and project peak activity for 2003. Peak conditions currently vary by event and by day with a nominal peak duration of 15-30 minutes. These peak durations will expand as the number of subscribers and total system usage increase. As presented in Table 1, 80% or greater peak utilization occurred in at least one region in 9 days in 2001, but in 200 days in 2002 with more than 330 days projected in 2003.

Table 1: Global System Capacity Utilization

Global System Capacity Utilization (days)			
	2001	*2002*	*Est. 2003*
80% or greater	9	200	330+
60% or greater	9	255	330+
40% or greater	70	330	330+

Table 2: Regional System Capacity Utilization

Eastern United States (days)			
	2001	*2002*	*Est. 2003*
80% or greater	-	-	2
50% or greater	-	8	300+
40% or greater	7	179	300+
Western United States (days)			
	2001	*2002*	*Est. 2003*
80% or greater	-	-	51
50% or greater	1	87	300+
40% or greater	47	261	300+

Middle East (days)			
	2001	*2002*	*Est. 2003*
80% or greater	9	200	300+
60% or greater	9	240	300+
40% or greater	16	300+	300+
30% or greater	30	300+	300+

Africa (days)			
	2001	*2002*	*Est. 2003*
80% or greater	-	-	25
60% or greater	-	-	11
40% or greater	-	25	242
20% or greater	4	113	300+

This analysis demonstrates Iridium's need for the FCC to assign it additional spectrum. Additional spectrum is required to ensure high quality services both in the U.S. and globally as is demonstrated by the increased congestion that Iridium is beginning to experience in certain regions of its network and due to the technical system parameters of the Iridium constellation. Table 2 above demonstrates that the regional congestion trends will continue to increase in 2003, without access to additional spectrum. In a variety of regions, satellite loading is approaching 80% for a number of days, leading to the pair of adverse system problems detailed above: call dropping and reduced call establishment. Even without ATC driving spectrum demands even higher, the current Iridium growth trends demonstrate that additional spectrum must be provided to ensure that its critical customer needs are satisfied in a seamless fashion.

As these capacity conditions have become more pronounced, Iridium has had an aggressive effort to maximize system capacity with the available spectrum. Satellite software modifications and gateway software enhancements have been completed and introduced maximizing use of the available spectrum. Enhancements have included power control refinements, satellite access and handoff algorithm enhancements as well as the introduction of low bandwidth messaging services. By this effort, Iridium has exhausted its ability to maximize system capacity through software enhancements. Additional spectrum is required for Iridium to increase further its system capacity.

7.0 FCC Approval Required for Use of Additional Spectrum

Use of additional spectrum by the Iridium system requires approval from the FCC. Iridium's current constellation utilizes the exact same spectrum bandwidth and frequency bands regardless of whether the satellite footprint covers the United States or some other part of the globe. This means that any changes to the spectrum used by the system would have to be implemented globally and thus approved by the FCC. Even if it were technically possible, Iridium could not use additional spectrum to serve foreign countries without the approval of the United States, which licensed the satellite system and is responsible for its coordination globally.

8.0 Utilization of Additional Spectrum

Iridium could quickly utilize any additional spectrum assignment. The software modifications necessary to leverage additional bandwidth can be accomplished within weeks allowing critical needs of both commercial and military to be supported immediately. Since the Iridium network has been designed to support 10.5 MHz of spectrum, minor configuration changes will allow the system to immediately support the additional spectrum. These changes include loading new frequency tables in the satellite constellation updating the terrestrial Iridium gateway databases and allocation tables. These changes can be completed and tested allowing full use of the additional spectrum within weeks.

The assignment of an additional 6 MHz of spectrum to Iridium will more than double the traffic capacity on the Iridium system. The Iridium system was designed to utilize 10.5 MHz of spectrum. That amount of spectrum represents an effective and efficient use of spectrum by the Iridium satellite system. Iridium's commencement of service with less spectrum has resulted in specific system inefficiencies with respect to satellite frequency reuse, intra and inter-satellite handoffs, satellite beam handoffs, and user/satellite access schemes. As system traffic exceeds 80% of capacity, carrier to interferer ratios (C/I) are impacted more significantly, which in turn gives rise to additional system self-interference. The assignment of at least 10.5 MHz of spectrum to Iridium will help eliminate these system inefficiencies and increase system capacity to a larger extent than represented by the spectrum increase alone.

9.0 Analysis of Spectrum Use for Ancillary Terrestrial Services (ATC)

In light of the Commission's stated intention of allowing ATC services within the Big LEO band, Iridium has initiated a series of technical evaluations on how it could make use of these services. Iridium has determined that the current 5.15 MHz of spectrum available for Iridium is insufficient for providing both satellite and ATC services in a commercially viable manner. As shown above, Iridium is experiencing spectrum congestion in a variety of areas without ATC capabilities. The added functionality inherent in ATC services cannot be realized in the same 5.15 MHz already congested with MSS traffic.

At least 10 MHz of spectrum is necessary to offer MSS and truly ancillary terrestrial service because the provision of ATC requires significant satellite/terrestrial coordination and places additional demands upon the available spectrum. First, the deployment of a terrestrial network in the same spectrum as the satellite system will cause additional interference from the ground base stations to the end user handsets. Harmful self-interference will be extremely problematic without sufficient spectrum to ensure proper frequency coordination between terrestrial base stations and end user handsets. Second, any MSS provider with significant MSS system loading will be unable to provide a viable satellite/ATC service without access to at least 10 MHz of spectrum for system operations as well as for network overhead.

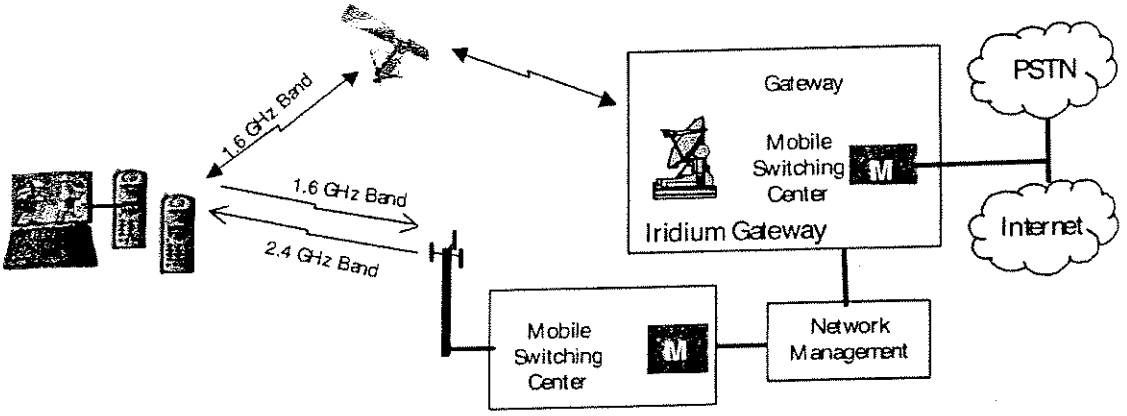
Iridium's constellation flexibility can be leveraged to provide for highly efficient ATC operation in conjunction with the Iridium network. The Iridium processing satellites provide a high level of flexibility achieved by extensive on board software/firmware. The satellite constellation consists of 66 operational satellites arranged in 6 orbital planes of 11 satellites. Each satellite supports four way cross-linking, allowing continuous communications with each satellite neighbor, the ground control system and the communications gateway. Each satellite continuously communicates with all satellite neighbors to ensure proper frequency coordination in orbit, manage proper subscriber satellite handoff and to ensure seamless ground coverage is maintained.

The Iridium ATC system could be a terrestrial system fully integrated with this existing satellite constellation. A central Network Management function could coordinate allocation of system resources and allow for efficient sharing of uplink frequency bands. While there are several approaches involving varying levels of system integration, all include utilizing the Iridium uplink band at 1.6 GHz for both the satellite and ATC segments. Augmented satellite functionality would add terrestrial segments into the dynamic uplink band sharing operation to coordinate satellite/terrestrial frequency assignments and efficiently allocate the needed bandwidth between the satellite and terrestrial segments. In addition, enhanced system functionality would add ATC base stations to satellite near-neighbors and employ Iridium gateway (or telemetry, tracking and command plus PSTN as communications infrastructure) to provide near-neighbor communications between the satellites and ATC components.

Iridium technically could provide the end user with a mobile handheld terminal that would operate in multi-mode fashion, allowing the user access to the satellite and terrestrial portions of the system with a single phone. Depending on available signal strength, capacity resources, and user preference, the phone and/or Network Management would make decisions about whether to serve the user by the satellite or terrestrial portion of the system.

Iridium would be in a position to offer terrestrial connectivity while continuing to provide mobile satellite services with sufficient additional spectrum at either the 1.6 GHz or 2.4 GHz band.

Additional spectrum at 2.4 GHz would provide Iridium paired spectrum. The availability of paired spectrum would permit Iridium more flexibility in signaling and result in more efficient spectrum use. For example, in the future, Iridium could downlink its satellite signal with 2.4 GHz spectrum and thus allowing for only interference and timing remediation for the 1.6 GHz band for the uplink path. Additionally, additional spectrum at 2.4 GHz would permit independent timing in the terrestrial network because voice/data could be sent and received at the same time due to frequency separation between the 1.6 GHz band and 2.4 GHz band.



Additional spectrum at 1.6 GHz only, can be supported by utilizing a time division duplex approach as a portion of the system approach to prevent channel interference within the single block of spectrum available for the signal uplink and downlink. Today, the Iridium system manages a cross-linked network of 66 satellites continuously coordinating 48 spot beams per satellite along with the many spot beams of each adjacent satellites moving with relative speeds up to 32,000 miles per hour. The efficient handling of these challenging conditions required the Iridium system design to be extremely capable and flexible. Leveraging this inherent system flexibility, Iridium can incorporate effective and spectrally efficient ATC services as long as it is provided sufficient spectrum.

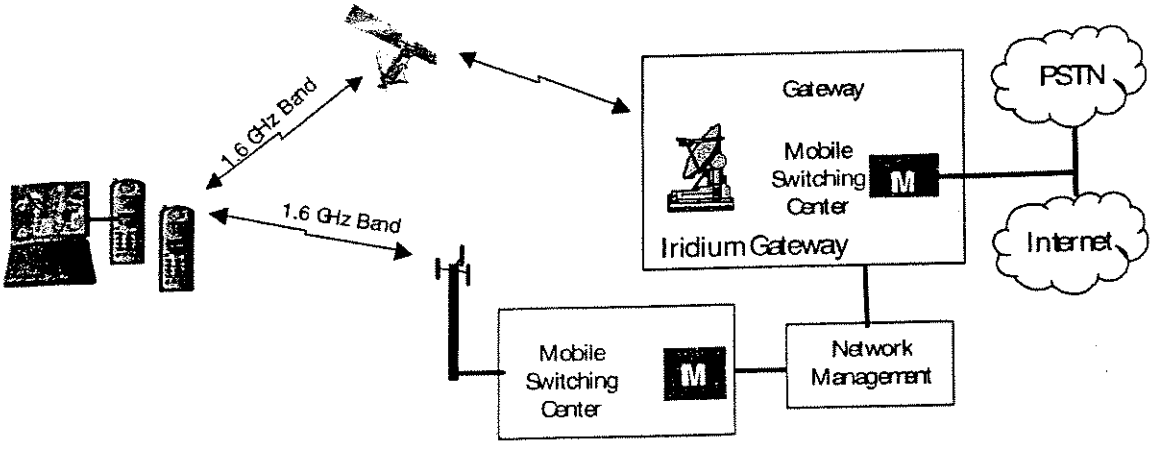


EXHIBIT C

March 2003

SPECIAL REPORT--Special Operations Forces

Special Operations Forces Become Network-Centric

Afghanistan proves the worth of total battlefield awareness.

By Robert K. Ackerman

Network-centric warfare proved to be a key enabler for U.S. special operations forces to rout the Taliban in Afghanistan, according to a general in the U.S. Special Operations Command. These forces were empowered by shared situational awareness and robust communications that allowed them to maximize the effects of air and naval support against Taliban positions.

This new approach to special operations did not emerge overnight. The command had sown the seeds of this capability several years ago with a shift in emphasis toward battlefield situational awareness. New technologies and systems acquired over the intervening years proved their worth in the network-centric environment.

The result has been a dramatic change in the way the U.S. Special Operations Command, or SOCOM, MacDill Air Force Base, Florida, conducts its missions. Its personnel in the field have the same training and ability to adapt to changing situations on the battlefield that has been their hallmark over the years. However, as part of the network-centric community, they now are able to tap a growing wellspring of battlefield awareness as well as link operationally with conventional forces from all the services.

Special operations forces (SOF) personnel now deploy with accurate maps, current information on the disposition of friendly and unfriendly forces in their area, and connectivity to support forces located throughout their battlespace. This new way of leveraging battlefield awareness represents the biggest change in the way SOCOM conducts its missions.

Brig. Gen. (P) James W. Parker, USA, is the director of SOCOM's Center for Intelligence and Information Operations. He explains that the adoption of network-centric capabilities laid the groundwork for the success in Afghanistan. This not only gave SOF greater access to vital information, but also created an environment that allowed greater flexibility on the part of both SOF personnel and those equipping and supporting them.

"Network-centric warfare theory and practice came together with great effect for U.S. special operations forces fighting in Afghanistan," Gen. Parker states.

Yet, even these successes gave SOCOM only a taste of its network-centric future. Ahead lies more work to ameliorate shortcomings exposed in the Afghanistan operations as well as to improve capabilities to an even greater degree.

When special operations forces arrived in Afghanistan after the September 11, 2001, attacks, they often found that they had the only communications assets for miles. The vast distances between units, coupled with this absence of an indigenous communications infrastructure, forced SOF units to rely heavily on their own line-of-sight and space-based systems, the general relates. He notes that the entire process of working with Northern Alliance forces was communications-intensive.

Congress aided these efforts by establishing the Defense Emergency Response Fund. SOCOM's acquisition executive used some of this funding to fill key communications shortfalls throughout the command, Gen. Parker recounts.

He describes several communications and information systems as "big winners" for SOF in Afghanistan. The biggest success, he says, was the most sought-after system, the Thales AN/PRC-148 radio, known as the multiband inter/intra team radio, or MBITR (SIGNAL, October 1997, page 57). The 31-ounce handheld squad radio with embedded communications security was the lifeblood for dispersed team members, as it extended the operating range of the teams and proved extremely reliable in the harsh desert environment, the general offers. "A typical comment was 'this is the best SOF communications system in years,'" he relates.

Ground-based SOF also used the multiband multimission radio, or MBMMR. This single-channel, ultrahigh frequency satellite communications radio proved highly useful for transmitting the locations of al Qaida and Taliban targets to various operations centers, which then could rapidly direct bombers and fighter aircraft to strike those targets.

Iridium handheld satellite telephones with secure sleeves also proved to be invaluable for diverse SOF units conducting split operations in the rugged mountainous terrain. Gen. Parker notes that the Defense Information Systems Agency worked closely with SOF to outfit and manage Iridium assets throughout operation Enduring Freedom. He reports that SOF liaison teams carried Iridium units during all operations with the Northern Alliance.

The rugged terrain and the wide dispersal of SOF teams increased the importance of satellite communication systems in Afghanistan. The general describes the U.S. Air Force Special Operations Command's communications team as key to SOCOM's strategic communications during operation Enduring Freedom. "Their innovative approach to assemble small, easily transportable communications packages set the standard, and the initial communications element--ICE--was a clear winner," he says. It gave SOF an early-entry, lightweight, multichannel satellite communications system and terminal equipment for initial communications in several undeveloped staging bases, he explains.

Commercial Inmarsat also played a large role in providing connectivity to remote locations. The SOF Deployed Node-Lite terminal, based on the M-4 Inmarsat terminal, provided secure voice and data capability to deployed SOF teams. The system comes with an Optiva server and Palladium secure modem to permit SOF users to dial into the secret Internet protocol router network, or SIPRNET.

Unexpected requirements generated surprise results. Some SOF teams operating with the Northern Alliance discovered that they needed to establish videoconferencing capabilities among the alliance's various elements. So, SOCOM procured small, briefcase-size units that were deployed among its forces.

On the networking side, the Tactical Local Area Network (TACLAN) suite of computers, network gear and associated software was another major SOF success, the general reports. The hardware platform for the SOF mission planning and execution system, TACLAN provides commanders with a ruggedized scalable system for command and control. The 20th Special Forces Group (SFG), a National Guard unit headquartered in Alabama, was the first unit to take TACLAN into Afghanistan using SOF's latest mission planning, coordination and collaboration tool suite, known as the SOF Digital Environment (SDE). SDE, under the management of one program manager, takes a system-of-systems approach to integrating the components of SOF's network-centric warfare into a single cohesive program.

SDE is the key battlefield information system for deployed special operations forces, the general continues. Residing on TACLAN hardware, it provides situational awareness, collaboration and mission planning software for three networks: Unclassified, Secret and Top Secret. It also includes display hardware such as projectors and screens to view graphics and overlays. The 20th SFG staff was able to plan future missions and monitor ongoing missions

from several locations using collaboration tools and software suites, including Microsoft NetMeeting and Information Work Space.

The 20th SFG used situational awareness applications such as the Automated Deep Operations Coordination System and Command and Control for Personal Computers (C2PC) to receive frequent and current unit location updates in near-real time. It used the Web Information Center (WIC), developed by the Special Operation Command-Joint Forces Command (SOCJFCOM) in Norfolk, Virginia, for sharing information using Web browsers on the SIPRNET. Units were able to access and coordinate plans, documents and briefings without e-mailing or faxing the material to all who needed it. The unit trained on SDE during exercise millennium challenge 02 in August 2002, and it took the tool suite to Afghanistan one month later.

Not all of SOCOM's network-centric experiences in Afghanistan were ideal. For example, the situational awareness picture was not available to everyone. Gen. Parker offers that the command must deploy the capabilities brought by SDE to all of the theater special operations commands in the regional combatant commands around the world. Additionally, it must include command and control enablers of its components, such as the innovative Mission Support Center developed by Naval Special Warfare Command, which provides Web-based access to vital information for deployed SEALs (sea, air and land). All SOF elements must be interlinked as SOCOM takes on the challenges of global operations, he says.

"It remains a challenge to get the common relevant operational picture to all operators on the ground," Gen. Parker allows. He notes that the Global Command and Control System (GCCS) populates and builds the common operational picture from several different feeds, and then it delivers this picture via the SIPRNET to many different automated systems such as GCCS-Army, GCCS-Maritime and C2PC. However, SOF operators cannot always carry desktop or notebook computers with them--especially equipment requiring SIPRNET connectivity. This is a luxury usually found at the "O5-level" tactical headquarters and higher, he says.

Part of the problem is that SOF teams must rely on low-data-rate tactical radios or mobile satellite services for their data feeds. The SDE program office is researching and developing ways to provide situational awareness down to SOF operators using wireless technology, data compression techniques and secure personal digital assistants, the general reports.

Inasmuch as network-centric warfare was a key ingredient in SOF's success during operation Enduring Freedom, Afghanistan offered more of a promise of

the advantages of network-centric warfare than an operational validation of its tenets, Gen. Parker states.

He continues that SOF needs to move beyond situational awareness to situational understanding. This will involve finding ways to collaborate across the enterprise to reach a common visualization of the battlefield and of the enemy's intent. This visualization must reach all levels of the enterprise, the general emphasizes.

To achieve this and other changes, SOCOM plans to change its own infrastructure. Gen. Parker reports that it has set out on an ambitious program to reduce its reliance on its own command-unique garrison SCAMPI communications network and rely more heavily on the Defense Information System Network (DISN). By leveraging DISN, SOCOM seeks to optimize its infrastructure. The goal is to get off SOF-unique infrastructure at the command's nondeploying headquarters, camps, posts and stations. It also would shift resources into strengthening the communications capabilities supporting theater special operations commands and deployed forces. The new Defense Information Systems Agency field office at SOCOM headquarters will assist greatly in achieving this goal, the general offers.

Private industry will play an important role in SOCOM's efforts to improve its operational capabilities. For example, the general notes that the weight of the gear a SOF warfighter carries on his back today is not significantly different from the amount carried by a Roman legionnaire. "We have all seen the pictures of SOF operators on horseback and donkeys loaded down with equipment," he says. "The warfighter needs lighter, multifunction communications equipment that has a small physical presence at the tip of the spear."

SOF seeks several information technologies and systems from private industry. Gen. Parker cites the need for a warfighter to have ubiquitous, beyond-line-of-sight broadband communications with multilevel security, thoroughly protected. "In fact, the military needs to get to a point where there are no constraints on bandwidth--any time, anywhere around the globe," he posits. SOF also needs long-lasting batteries, unbreakable cryptographic algorithms, interoperable secure voice telephone networks, self-healing networks, on-the-fly translating equipment and secure connectivity to coalition partners.

The general notes that SOF equipment must be able to operate in all climates and under all environmental conditions--from arctic cold to desert heat to jungle humidity. Another fact the military learned in the mountains of Afghanistan is that it needs a radio that can penetrate underground into caves.

And, all radios should require little or no training to use, the general declares. SOCOM also needs radios capable of transmitting voice, data and full-motion video images in near-real time to both joint and coalition forces. "This is a difficult task to be sure, but it is where we need to go," he states.

"Complex technologies are needed today," he continues. "SOF needs robust information assurance tools that automatically identify, analyze and correct network and system vulnerabilities. The warfighter needs improvements in data compression techniques and multiplexing, higher throughput rates for wireless equipment and improved remotely controlled vehicles for special reconnaissance and sensor delivery."

All of these new technologies must allow SOF to collaborate with U.S. government agencies, the military services, coalition and allied partners, and nongovernmental agencies, Gen. Parker emphasizes. This implies the need for implementing and managing enterprise systems, both in-garrison and deployed, that allow information sharing horizontally, vertically, internally and externally. He adds that implicit in this requirement is the need for open standards, interoperability, enterprise architectures and effective enterprise management tools. "Most of all, SOF needs to smartly leverage existing and forthcoming information technology to create information synergy that enhances the capabilities of commanders and warfighters," he says.

"Without a doubt, SOCOM's future is inextricably linked to industry's future and the explosive growth in information technology and systems," Gen. Parker declares.